Laser-Assisted Data Acquisition of Building Geometry for IV20

User Manual

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Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

DEPARTMENT OF CIVIL ENGINEERING
AALBORG UNIVERSITY

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ISSN 1901-726X
DCE Technical Report No 281

Aalborg University
Department of Civil Engineering
Architectural Engineering

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Summer 2019

Scientific Publications at the Department of Civil Engineering

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Published 2019 by
Aalborg University
Department of Civil Engineering
Thomas Manns Vej 23
DK-9220 Aalborg Øst, Denmark

Printed in Aalborg at Aalborg University

ISSN 1901-726X
DCE Technical Report No. 281

Recent publications in the DCE Technical Report Series

ISSN 1901-726X

DCE Technical Report No. 281

Contents

1 Introduction

This report presents how to use Magicplan as Data Processing Software (Software) for Laser-Assisted Data Acquisition (LADA). All uses of Magicplan are based on the technical report: Laser-Assisted Data Acquisition Of Building Geometry: Selection and use of laser meters and data processing software for IV20 by: Wyke et al.,(2019).

The LADA process presented in this report is made for IV20 but can have application for data acquisition in other contexts as well. LADA in this report only supports acquisition of oddly shaped geometries supported by Magicplan.

The setup used in the user manual:

Handheld Laser:	Leica Disto D910
Software:	Magicplan
Tablet:	Apple iPad Air 2 Wi-Fi tablet.

IV20 does not demand 100% precision in measurement. But the more accurate acquired the data are, the more use the data have. Measuring must be done, as shown in figure 1.1.

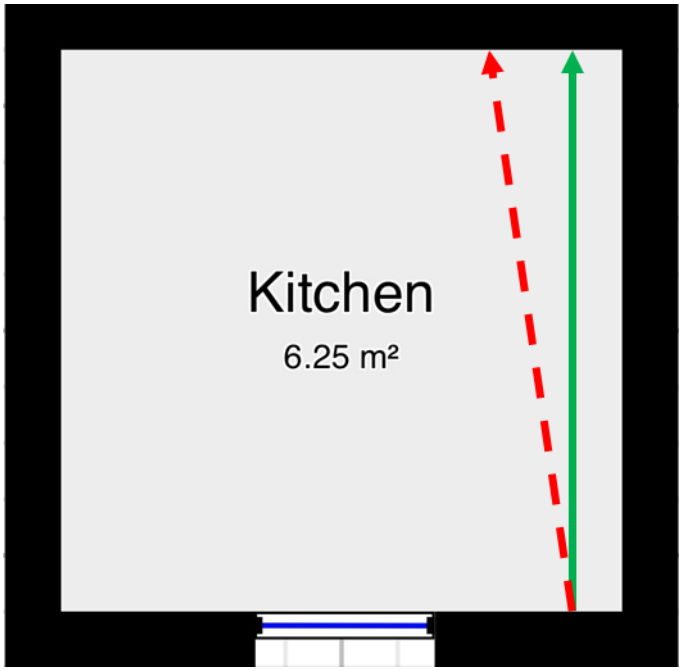

Figure 1.1 The green arrow indicated how a distance must be measured. The red arrow shown how not to.

Read more about measuring and modelling rules in the technical report: Laser-Assisted Data Acquisition Of Building Geometry: Selection and use of laser meters and data processing software for IV20 by: Wyke et al.,(2019), chapter 2.2 and 4.4

2 Setup

Take the following steps to pair the laser meter to the software on the handheld through Bluetooth. Pairing can be done before the selection of new plan/ room is selected or after.

1) Open Bluetooth setting on your device
2) Delete the Leica Disto unit on the iPad under Bluetooth/ my units.
3) Pair Handheld laser and Application through Magicplan.
   If the third step does not work, the following steps will make it possible to pair the laser meter to the application.
   a) open Functions, on the Leica Laser Meter
   b) open Sittings
   c) open Bluetooth
   d) open Bluetooth settings
4) Open Magicplan on the handheld device
5) Create a room
6) Select “Room L/W”
7) Select laser
8) Pair laser with Magicplan is shown in figure 2.1.

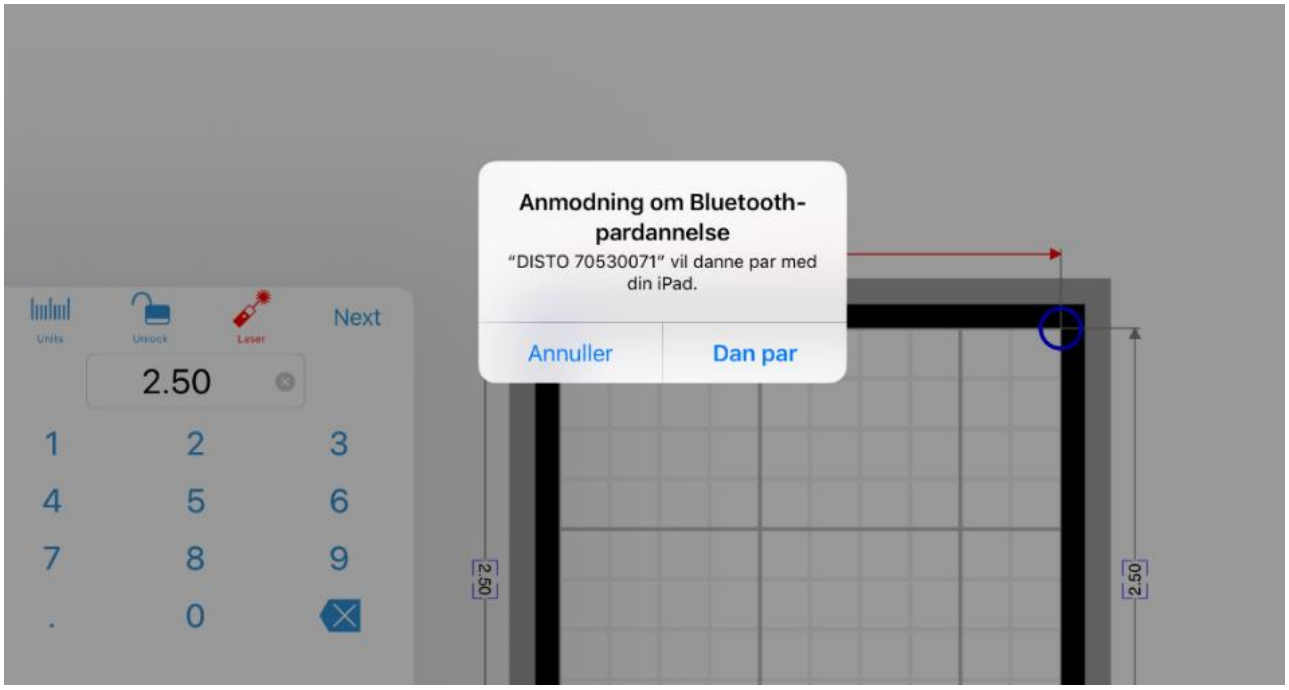

Figure 2.1 Bluetooth pairing

Make sure laser meter and handheld device are fully charged. Lack of power can limit the range and/or the use of Bluetooth.

The laser meter can be used in multiple ways. The photos in figure 2.2 and 2.3 show the two primary methods. This manual will only consider the method shown in figure 2.2.

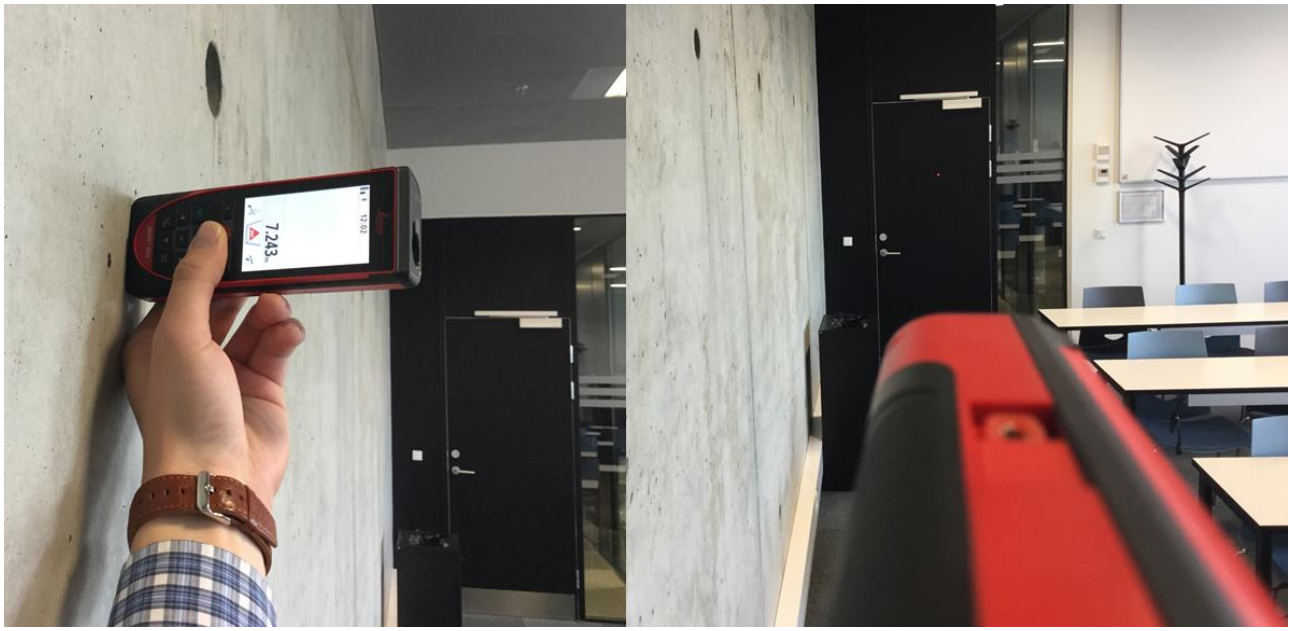

Figure 2.2 Using the laser meter as a high- tech measuring tape.

Figure 2.3 The laser meter placed on a tripod, measuring from a fixed position.

Magicplan can be used freely to model geometries based on measurements. However, data export is not possible without a license. Pay notice not to buy a yearly license, if a monthly licence is all you need.

3 Measuring and modelling

Open the Magicplan application. Select “new plan” and select “create new room” as shown in figure 3.1. In most cases, the most efficient way to start modelling is by selecting the “Square room” option.

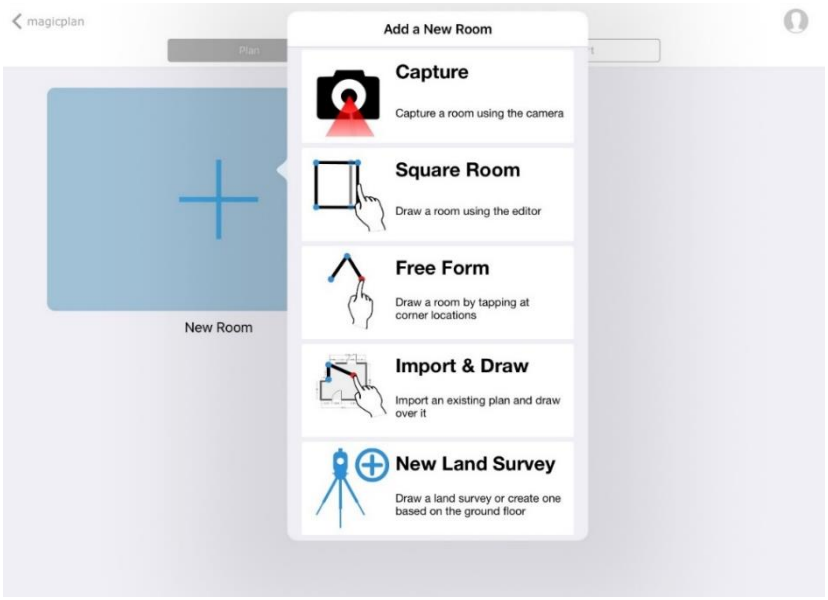

Figure 1.1 Selection of new room

To change the predefined ceiling height and interior and external wall thickness for the project press the “information” icon in the top of the Magicplan User interface (UI) as shown in figure 2.2.

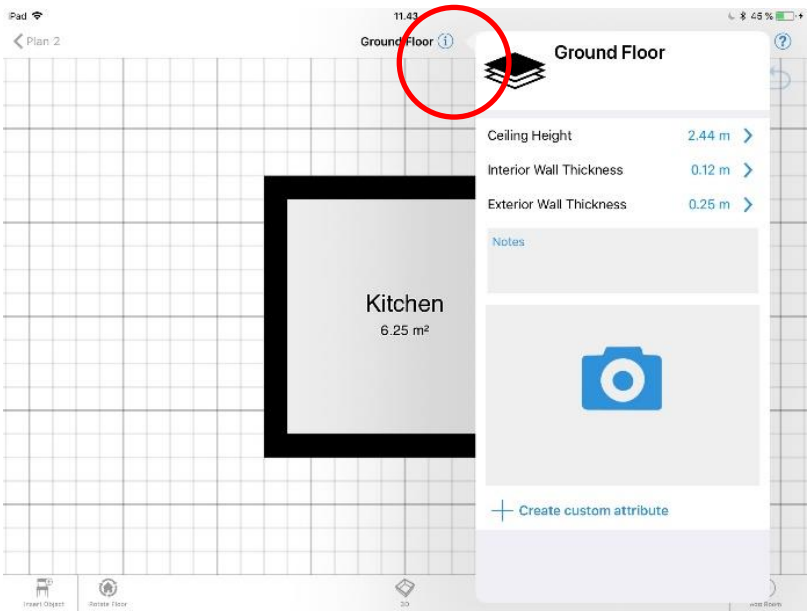

Figure 2.2 Predefined information menu

If laser and software are paired correctly, the measurement will automatically appear in the application, as shown in figure 2.3 when a measurement is taken using the handheld laser (It can take a couple of seconds for the hardware to transfer measurement from laser meter to Magicplan).

Figure 2.3 Measurement box in Magicplan

Using the “Add corner” and “Add wall” function in the lower left corner it is possible to change the shape of the predefined geometry, and use the laser meter to attain the correct distances. Shown in figure 2.4.

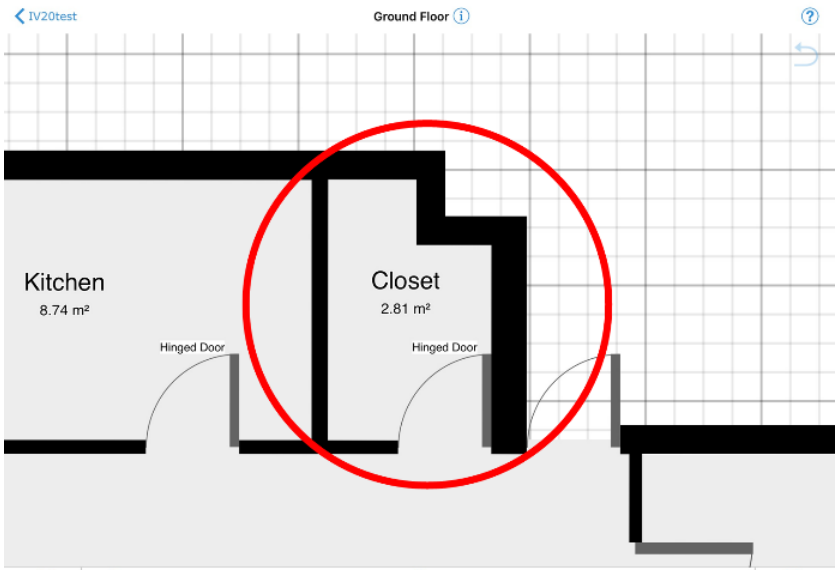

Figure 2.4 Changed geometry.

When using LADA, it is possible to measure and model one room at the time and then attach rooms continuously through the process or when all rooms are modelled. It is recommended to model doors and windows for each room, before attaching two rooms. In connected rooms, it is important to only model the door or window once. Objects modelled twice will make the data export inaccurate. To prevent unintended double modelling, it can be a good idea to begin the LADA in the room with the most door, which is usually the hallway.

Ceiling height I a parameter which can also be set on room basis. It can be altered pressing on the room needing a changed height and the “information” icon on the lower right of the UI.

Magicplan can document building material, surface and components either by placing notes on wall, windows, door, etc. (components) or through photos, with notes attached to room or building component. Notes and photos can be viewed in the UI by selecting the information logo for either building component or room in the same manner as in figure 2.5.

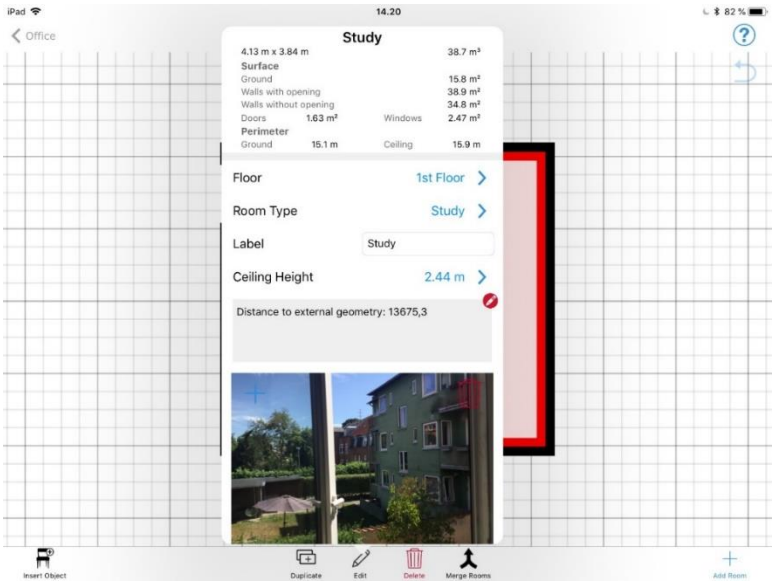

Figure 2.5 Documentation function in Magicplan

When selecting a component and selecting its “information” icon, labels and values can be attached to the component. Customisation of attributes is also possible. A yes/ no attribute can be created, e.g. documenting if there is a heat source under a window. Such attributes is reflected in the .CSV export from Magicplan. Such attributes can also be attached to a room. It is, however, be recommended to only attach attributes to components.

The final feature of the modelling UI is the 3D viewer, which needs Internet access to use. It allows for viewing of the model in 3D and can be used to quality control for overlapping components or wrong geometry. Each room can also be viewed as an elevation as shown in figure 2.6.

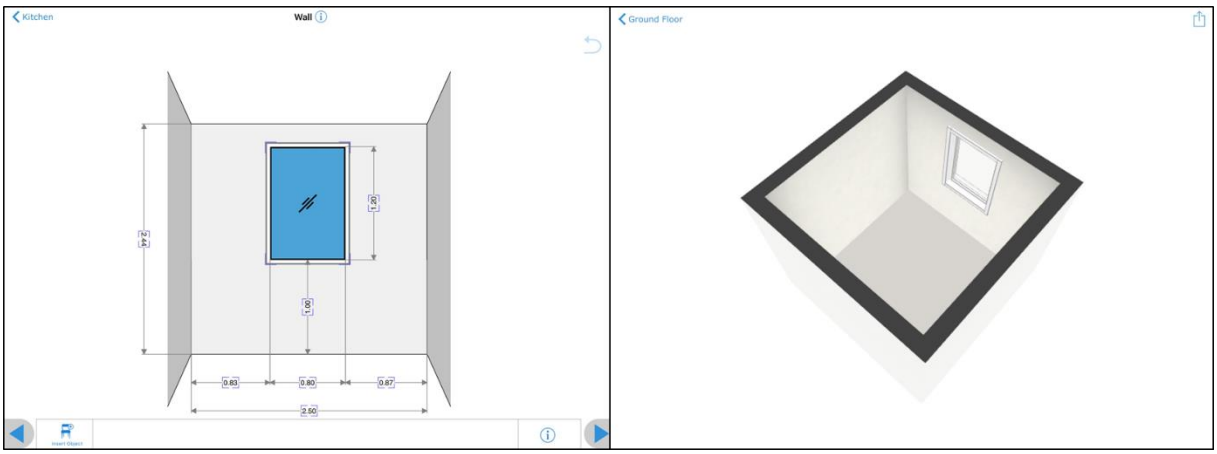

Figure 2.6 Left: Elevation of room in Magicplan. Right: 3D viewing of the same room.

In addition to model and store acquired geometric data, Magicplan can be used to store photos. This function in unison with the note function in the application can be used to document distances to points of view in and out, by taking photos and noting the laser measured distance.

Be aware of the anchoring or lock/ unlock function in Magicplan, as it automatically activates when inserting objects such as windows or door in a wall. The measuring menu allows unlocking a locked object, as shown in figure 2.7.

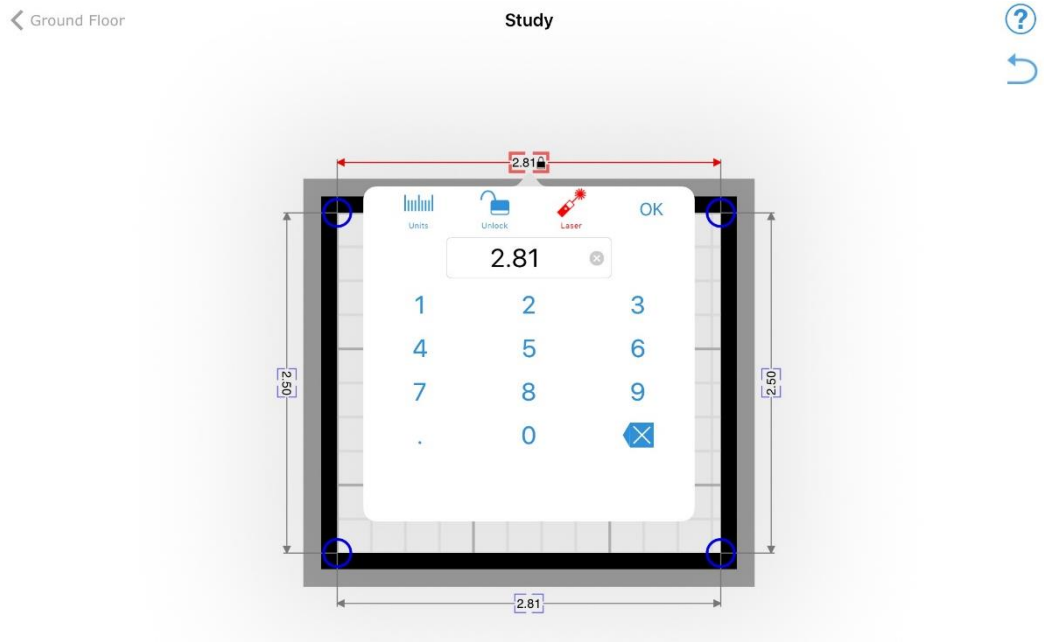

Figure 2.7 The lock/ un- lock function in Magicplan

Modelling windows and doors follow the same procedure. Select object chose type. Insert type into the hosting wall in the floorplan. Access the information about the window by double-clicking on the object and select the information icon. This will bring forth the menu shown in figure 2.8.

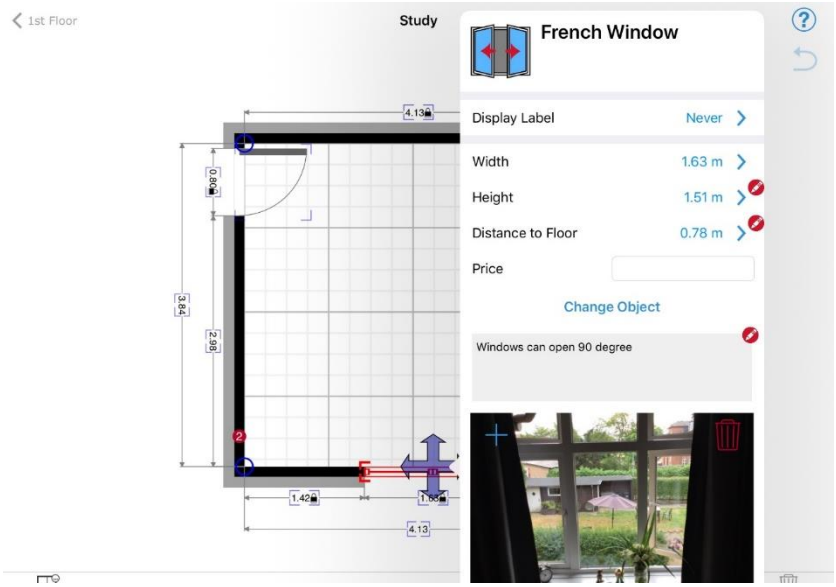

Figure 2.8 Changing measurements of a window. Notes and photos can be attached to an object in the same menu.

When joining two or more rooms, it is also important to ensure their placements are correct. The easiest way to make sure rooms are placed correctly is by joining rooms continuously through the LADA process.

If the building being scrutinised using LADA consist of multiple floors, slap must be captured through a note connected to the floor plan; as such, data cannot be indicated elsewhere in Magicplan.

4 External measuring

Acquisition of external objects and such measurements is currently not done using Magicplan. This is done for IV20 using only Leica Disto technology. Some distances can, however, be measured and stored in the application through photos and notes, as earlier described.

This YouTube video shows the data acquisition process for generation of a .DXF file with external objects: https://www.youtube.com/watch?v=G_1GBVAnDgo

Using photo documentation with attached notes can be a mean of acquiring and storing data of external geometries, as shown in figure 2.5.

The surveying function in Magicplan can be used for documentation as well. Data from said function is however not exportable from Magicplan as of the release of this report.

Magicplan makes it possible to submit address and photos of the location being scrutinised. When an address is entered, Magicplan provided the GPS-coordinates of the location, based on Google maps, as shown in figure 4.1. The function only works when Magicplan has a connection to the internet. When exported in one of the many formats Magicplan offers, coordinates are only present in the .CSV export. This function allows users of LADA for IV20 to acquire the exact location of a building in order to import data to IV20 from public and private databases and maps.

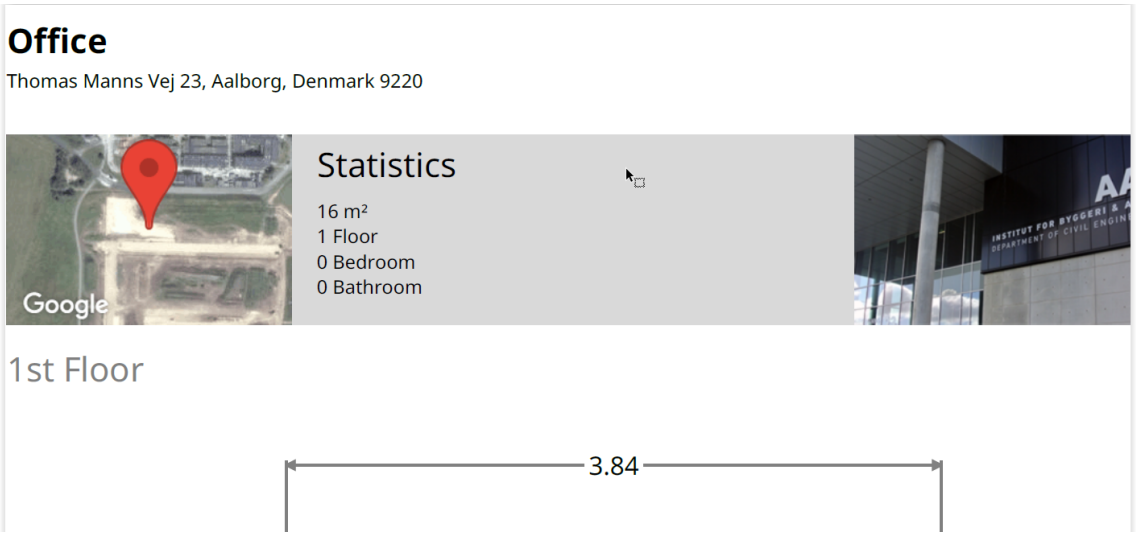

Figure 4.1 Address and photo documentation of building. Photo of building belongs to © civil.aau.dk. The map showed in the figure was printed from Magicplan using © Google Maps.

5 Export from Magicplan for IV20

Magicplan allows export of various data in multiple formats. As this manual is intended for LADA for IV20, only two exports are elaborated on in this chapter. The technical report: XXX.XXXX by: Wyke et al., 2019, presents the export functionalities not used with respect to IV20.

As shown in figure 5.1, the two exports relevant with respect to IV20 are the Report via Email function and the Statistics export. The .PDF report, sent through Email under “Get Floor plan Report via Email” contain building drawings and photo documentations whilst the .CSV file contains all geometric data and attributes information.

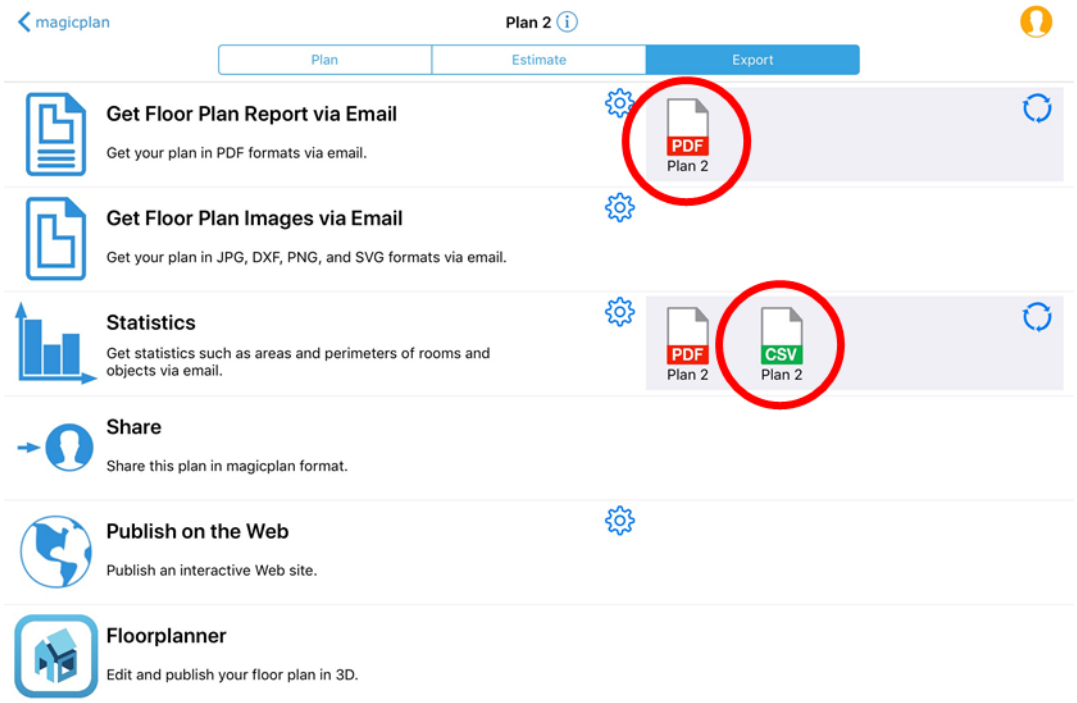

Figure 5.1 The red circle indicates which exports are needed for IV20

The .PDF report via Email contains information that allows the IV20 user to gain an overview of what data are acquired and go through notes and photo documentation from the LADA process manually.

The statistics .PDF contains geometric statistics for each room measured as shown in figure 5.2.

Statistics

Summary

Floors	1	Bedroom	0	Windows	1	Ground surface with all walls	20.07 m²	Exterior Perimeter	17.93 m
Rooms	1	Bathroom	0	Doors	1	Ground surface with interior walls	15.84 m²		

	Volume	Ground surface without walls	Walls with opening	Walls without opening	Ground Perimeter	Ceiling Perimeter	SurfaceOfWindows	SurfaceOfDoors
TOTAL	39 m³	15.84 m²	38.87 m²	34.77 m²	15.13 m	15.93 m	2.47 m²	1.63 m²

Figure 5.2 .PDF statistics report from Magicplan

Using the .CSV format, it is possible to attain all geometric data on the room scrutinised as well as notes and GPS- location.

1. Before the data in .CSV is usable for IV20 the process described hereafter must be followed.
2. Select the “Text to Columns” function in the “Data”-tab.
3. Select “Delimited” as the *best* file- type to describe the data.
4. Set “Text to Columns”- menu
5. Set “Delimiters” to “Tab” and “Comma.
6. Select: “General” column data format
7. Press “Finish” in the menu and the data will be organised as shown in figure 5.3

1	PLAN ATTRIBUTES											
2	Ground surface with all walls: m²	20.07										
3	Ground surface with interior walls: m²	15.84										
4	Ground surface without walls: m²	15.84										
5	Volume: m³	39										
6	Perimeter: m	17.93										
7	Floor	1										
8	Room	1										
9	Bedroom	0										
10	Bathroom	0										
11	Window	1.00										
12	Walls with opening: m²	38.87										
13	Walls without opening: m²	34.77										
14	Latitude	570.147										
15	Longitude	997.319										
16	Date	30-07-2018										
17	Notes	https://www.civil.aau.dk/										
18												
19												
20	FLOOR ATTRIBUTES	Ground surface without walls: m²	Volume: r	Ground P	Ceiling Pe	Walls with	Walls with	Ground su	Ground su	Exterior W	Interior Wall Thickness	
21	1st Floor	15.84	39	15.13	15.93	38.87	34.77	20.07	15.84	0.25 m	0.12 m	
22												

Figure 5.3 Organised data in Microsoft Excel from .CSV

Data regarding external geometries modelled in Magicplan Surveying will not be exported in the .CSV format.

When data in .CSV is restructured in Excel the data can be manually copy-pasted into the IV20 tool. Automation of this process is currently under development.

Acknowledgements

The work presented in this paper was made possible by the support of the dedicated partnership REBUS - Renovating Buildings Sustainably. The partnership is funded by Innovation Fund Denmark, Realdania and The Landowners' Investment Foundation (in Danish Grundejernes Investeringsfond).

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Wyke, S. C. S., Svidt, K., Jønsson, K. T., Rohde, L., & Jensen, R. L. (2019). *Laser-Assisted Data Acquisition Of Building Geometry: Selection and use of laser meters and data processing software for IV20*. In *DCE Technical Report,* Aalborg, Denmark . DCE Technical Reports, Nr. 280, Aalborg, Denmark. Retrieved from https://vbn.aau.dk/da/publications/laser-assisted-data-acquisition-of-building-geometry-selection-an